

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of

**RULEMAKING TO AMEND PARTS 1, 2, 21, AND
25 OF THE COMMISSION'S RULES TO
REDESIGNATE THE 27.5-29.5 GHz
FREQUENCY BAND, TO REALLOCATE THE
29.5-30.0 GHz FREQUENCY BAND, TO
ESTABLISH RULES AND POLICIES FOR LOCAL
MULTIPOINT DISTRIBUTION SERVICE AND
FOR FIXED SATELLITE SERVICES**

CC Docket No. 92-297

OPPOSITION OF TELEDESIC CORPORATION

Teledesic Corporation hereby submits this Opposition to the Petition for Partial Reconsideration and/or Clarification filed by Motorola Global Communications, Inc.¹ Motorola objects to the Commission's current geographic coverage requirement for systems using non-geostationary orbit in the fixed satellite service ("NGSO FSS"), namely, that NGSO FSS systems provide continuous service to all fifty states, and serve

¹ Petition for Partial Reconsideration of and/or Clarification of the Third Report and Order in CC Docket No. 92-297 of Motorola Global Communications, Inc. (filed December 19, 1997). Hughes Communications Galaxy, Inc. ("HCG") also filed a Petition for Reconsideration or Clarification in which it seeks clarification of which frequencies have been allocated internationally for primary use by GSO FSS systems. Petition for Reconsideration or Clarification of Hughes Communications Galaxy, Inc. (filed December 18, 1997). Specifically, HCG seeks Clarification that the 17.7-20.2 GHz and 27.5-30.0 GHz bands, with the exception of the 18.8-19.7 and 28.6-29.25 GHz portions, are available on a primary basis for use by GSO FSS systems. In the final paragraph of its Petition HCG asks the Commission to confirm that the HCG Spaceway system "is authorized to conduct international operations across the full bandwidth at Ka band that is available for GSO FSS systems on a primary basis." So long as HCG meant to incorporate its previously mentioned exception into its request for primary operation across the full bandwidth of the Ka band, Teledesic does not object to HCG's Petition.

latitudes between 70° North and 55° South at least 75% of every 24-hour period.²

Motorola urges the Commission to replace this requirement of actual coverage with a rule based solely on elevation angles. Under Motorola's proposal, a location would be deemed "covered" by an NGSO FSS system whenever a satellite is visible 5° above the horizon, regardless of whether adequate service could in fact be provided from that angle.

The Commission should firmly reject Motorola's proposal. The unique promise of broadband NGSO FSS is to provide "fiber-like" quality of service to virtually any location on Earth. The Commission's coverage rules are designed to ensure that this fiber-like service is actually provided throughout the coverage area. Motorola's proposal is based on rules developed for a completely different service operating in frequencies with dramatically different propagation characteristics. Applying that rule to NGSO FSS systems in the Ka band would replace what should be a multi-factored, *qualitative* evaluation with a one-factor *quantitative* test. Such a rule would fail to achieve the policy goal behind the Commission's coverage rule: ensuring that fiber-like service is actually provided in the coverage areas defined by the Commission rules. The Commission should reject the proposed rule change and confirm that the benefits of NGSO FSS technologies must be extended throughout the entire coverage area.

I.

THE COMMISSION SHOULD REQUIRE EACH NGSO FSS SYSTEM TO PROVIDE ACTUAL SERVICE THROUGHOUT THE COVERAGE AREA

NGSO FSS systems are unique in their ability to provide high quality broadband service throughout the world. Because NGSO satellites move in relation to the Earth's

² Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency band, to Establish Rules and Policies for

surface, rather than orbiting over a fixed point, they can provide global broadband coverage more economically than any other type of system. They also do not suffer from high transmission delay inherent in communications through geostationary (“GSO”) satellites. Hence, they can offer users in traditionally underserved areas broadband service comparable to that available via terrestrial fiber networks in the most densely populated areas of the most developed countries.

Recognizing these attributes, the U.S. delegations to the last two World Radiocommunication Conferences have successfully argued that a portion of the world’s radio spectrum should be made available for use by NGSO FSS systems. As explained in the U.S. proposal to WRC-95,

Due to the high cost of putting in place wireline or terrestrial networks, *rural areas of the United States and many remote areas of the world* do not have access to advanced communications networks. Because of the greater cost of providing terrestrial based facilities to *less populous regions*, those regions may never receive advanced terrestrial communications infrastructure. NGSO FSS low earth orbiting broadband satellite networks would enable local telephone companies, network service providers, and government authorities *around the world* to cost-effectively modernize the existing communications infrastructure, increasing economic opportunity and enhancing quality of life.³

The Commission followed up domestically by promulgating the coverage requirement and articulating a vision that NGSO FSS systems should provide “seamless global communications network[s].”⁴

Because NGSO FSS networks are secondary to GSO networks in every band except the 28.6-29.1 GHz and 18.8-19.3 GHz bands, these frequencies are the only ones

Local Multipoint Distribution Service and for Fixed Satellite Services, *Third Report and Order*, ¶ 34 (rel. October 15, 1997) (“Third Report and Order”).

³ United States of America, Proposals for Agenda Items 2.1 and 4, “Regulatory Provisions for Non-Geostationary Fixed-Satellite Services,” Doc. No. 015-E (13 July 1995) (emphasis added).

⁴ *Third Report and Order*, ¶ 34 (rel. October 15, 1997).

in which NGSO FSS networks can realize their full potential for universal access to fiber-like service. Accordingly, the only spectrum designated internationally for NGSO FSS networks should not be wasted on systems that do not offer fiber-like quality of service without the use of non-standard equipment throughout the entire coverage area.⁵

A definition of mandatory coverage area based solely on a minimum elevation angle, as proposed by Motorola, would undermine the Commission's goal of promoting true global networks. Minimum elevation angle is not an adequate proxy for demonstrating adequate coverage. For example, the specified minimum elevation angle might, for a given system, be so low that it would be impossible to close a communications link. Alternatively, a system might technically meet a minimum elevation angle requirement, but only by offering inferior service in some parts of the coverage area by requiring the use of large and expensive earth terminals. Indeed, the limited production volumes of such special terminals might have the practical economic effect of precluding service altogether in some regions. Any of these scenarios would be inconsistent with the Commission's determination in the Ka-band service rules that NGSO FSS systems must be *capable of providing service* in the defined coverage areas.⁶

The Commission should consider these factors in determining whether the coverage area is truly served by a proposed system. A system which offers only a theoretical possibility of service to regions within the coverage area does not offer a "seamless global communications network," and the Commission's coverage area requirement should not be watered down in order to excuse such a system's non-

⁵ Some elements of service quality can be defined mathematically, such as maximum bit error rate, latency, and availability in various rain zones. Other elements are clearly qualitative, such as blockage from terrain and buildings. Given the complexities involved, Teledesic strongly urges the Commission to adhere to its current rule, applying it qualitatively on a case-by-case basis.

compliance. Whatever minimum elevation angle a system uses, NGSO FSS operators should offer fiber-like quality of service virtually everywhere within the mandated coverage area without the use of non-standard equipment. The fact that such an outcome is possible is the unique promise of NGSO FSS systems. It should not be squandered.

The rule proposed by Motorola would encourage cream-skimming — *i.e.*, designing one's system to serve only the most lucrative markets — by permitting NGSO FSS operators to rely on a mathematical calculation of elevation angles rather than provision of actual service in the real world. Users in some regions should not have to purchase more expensive equipment or accept significantly lower quality of service than users in other portions of the coverage area. The Commission should therefore reject Motorola's proposal and announce that NGSO FSS applicants will not be licensed if they fail to provide adequate service everywhere in the coverage area.

Finally, the minimum elevation angle of a system will not demonstrate adequate service throughout the coverage area in situations where operational constraints interrupt service. If a system must stop transmitting at a given elevation angle in a certain geographic location because it will interfere with other licensed systems (*e.g.*, by not properly avoiding the geosynchronous arc), that system does not offer adequate service to that location. For example, the Celestri LEO system proposed by Motorola cannot provide uninterrupted service above 68° latitude in the NGSO band without avoiding the geosynchronous arc when low-elevation GSO FSS terminals are in the area. Such limitations, in addition to minimum elevation angle, must be considered when evaluating whether a system truly satisfies coverage area requirements.

⁶ *Third Report and Order*, ¶ 34.

II.

IF THE COMMISSION DECIDES TO DEFINE A MINIMUM ELEVATION ANGLE, FIVE DEGREES IS MUCH TOO LOW

If the Commission decides to define a minimum elevation angle requirement (which it should not do), it should adopt an angle substantially higher than 5°. First, systems operating at 5° in the Ka Band would face serious degradation of service quality due to rain attenuation. At low elevation angles the signal must travel a greater distance through the atmosphere. In rainy conditions especially, this increase in distance between the space station and earth terminal has a profoundly negative effect on service quality. Second, as the elevation angle decreases, the signal becomes more prone to blockage from terrestrial obstructions. Hence, siting earth terminals would be especially difficult for users living in areas requiring use of an elevation angle as low as 5°.

Motorola tries to obscure these points by suggesting that the Commission adopt the minimum elevation angle requirement established for Big LEO systems. This is inappropriate for a number of reasons. First, the two services are fundamentally different. Big LEO service is akin to terrestrial cellular phone calls, which do not require fiber-like reliability or performance. Broadband NGSO FSS must have fiber-like performance or it will not fulfill the promise the whole world has recognized in it.

Second, the potential for service quality degradation from rain attenuation and terrestrial blockage is much more pronounced at high frequencies, such as the Ka band. The L band (in which the Big LEOs operate) and the Ka band have dramatically different propagation characteristics. The increased difficulties that would be faced in the Ka band are illustrated by considering rain attenuation characteristics for the City of New York at 20 GHz and 30 GHz (Figure 1) and at 1.5 GHz (Figure 2).

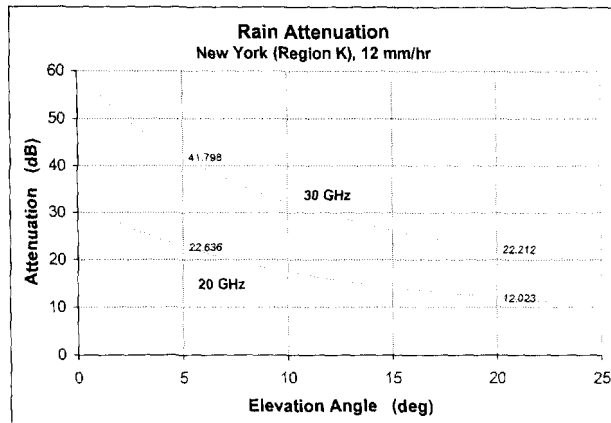


Figure 1. Rain Attenuation at 20 and 30 GHz.

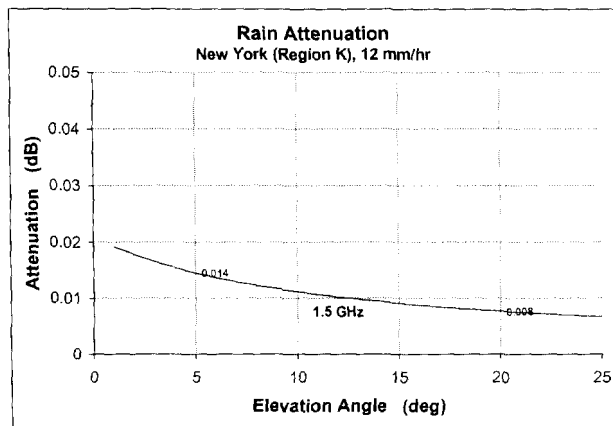


Figure 2. Rain Attenuation at 1.5 GHz.

These charts demonstrate that systems transmitting on the higher frequencies are more susceptible to rain attenuation when using low elevation angles. A system at 30 GHz, for example, will suffer from a variation in rain attenuation of about 20 dB if it lowers its elevation angle from 20° to 5°. At 20 GHz, the variation would be 10 dB, and at 1.5 GHz, only 0.06 dB. Clearly, it would not make sense to establish the same minimum elevation angle at 28 GHz as at 1.5 GHz.

In fact, the inadequacies of using a 5° minimum elevation angle in the Ka band are revealed when it is applied to Motorola's own Celestri LEO system application. Motorola admits in the application and in its recently filed Opposition to Teledesic's Petition to Deny that users at extreme latitudes will be forced to use larger earth terminals

to access the Celestri system.⁷ It also admits that “it is true that in some cases at or beyond 70° North Latitude additional care will be necessary to select terminal locations that permit relatively unobstructed views to a particular satellite.”⁸ Motorola fails to understand the problem with such uneven service coverage noting that “larger terminals have been used for years by the satellite industry to extend the coverage of satellite communications systems.”⁹

Motorola’s inability to appreciate the inadequacies of its Celestri system mirrors the fundamental deficiency of its elevation angle proposal. It is precisely because satellite operators have short-changed underserved areas “for years” that the Commission should save the extremely scarce NGSO FSS primary spectrum for systems with the capability to provide workable global service. Motorola’s proposal of a 5° elevation angle – and its proposal to focus solely on elevation angle in the first place – jeopardize

⁷ Application for Authority to Construct, Launch, and Operate the Celestri Multimedia LEO System, File No. 79-SAT-P/LA-97, at 78 (filed June 13, 1997); Motorola Global Communications, Consolidated Opposition and Reply Comments, File No. 79-SAT-P/LA-97(63), at 23 (filed February 2, 1998) (“Consolidated Opposition to Petition to Deny”).

⁸ Consolidated Opposition to Petition to Deny, at 24.

⁹ *Id.*, at 23 n.44.

the unique potential of NGSO FSS systems. For this and all the foregoing reasons,
Motorola's Petition for Partial Reconsideration and/or Clarification should be denied.

Respectfully submitted,

TELEDESIC CORPORATION

A handwritten signature in black ink, consisting of two large, overlapping loops followed by a horizontal line.

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Dated: February 5, 1998

CERTIFICATE OF SERVICE

I, Mark A. Grannis, hereby certify that copies of the foregoing "Opposition of Teledesic Corporation" were served, via hand delivery, upon the following this 5th day of February, 1998:

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